

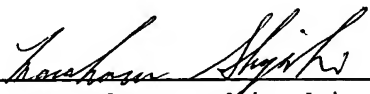
D E C L A R A T I O N

I, Masaharu Shizuki, c/o Ohshima and Company, BN GYOEN Building, 17-11, Shinjuku 1-chome, Shinjuku-ku, Tokyo, Japan do solemnly and sincerely declare as follows:-

1. I am well acquainted with the Japanese and English languages.
2. The following is a true translation into the English language about the certified copy of Japanese Patent Application No.2003-383825 in respect of an application for Letters Patent filed with the Japanese Patent Office on November 13, 2003.

And I make this solemn declaration conscientiously believing the same to be true.

dated this 29th day of January, 2009

  
Masaharu Shizuki

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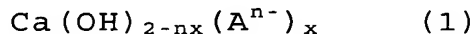
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[Title of Document] Claims

[Claim 1]

A synthetic resin composition comprising:

- (i) 100 parts by weight of synthetic resin, and
- (ii) 0.1 to 10 parts by weight of calcium hydroxide compound represented by the following formula (1):



(wherein n represents an integer of 1 to 4, x represents a number of 0.001 to 0.2, and  $\text{A}^{n-}$  represents an anion derived from at least one compound selected from the group consisting of a silicon-based compound, a phosphorus-based compound, an aluminum-based compound, an inorganic acid and an organic acid.)

[Claim 2]

The synthetic resin composition of claim 1, wherein  $\text{A}^{n-}$  is  $\text{SiO}(\text{OH})_3^-$ ,  $\text{Al}(\text{OH})_4^-$ ,  $\text{Cl}^-$ ,  $\text{NO}_3^-$ ,  $\text{H}_2\text{PO}_4^-$ ,  $\text{C}_6\text{H}_7\text{O}_7^-$ ,  $\text{SiO}_2(\text{OH})_2^{2-}$ ,  $\text{Si}_2\text{O}_6(\text{OH})_6^{2-}$ ,  $\text{HPO}_4^{2-}$ ,  $\text{C}_6\text{H}_6\text{O}_7^{2-}$ ,  $\text{PO}_4^{3-}$ ,  $\text{C}_6\text{H}_5\text{O}_7^{3-}$ ,  $\text{Si}_4\text{O}_8(\text{OH})_4^{4-}$  or a mixture thereof.

[Claim 3]

A synthetic resin composition comprising:

- (i) 100 parts by weight of a synthetic resin, and
  - (ii) 0.1 to 10 parts by weight of calcium hydroxide compound obtained by:
    - (ii-1) causing calcium oxide to undergo a slaking-reaction in water, or
    - (ii-2) causing a water-soluble calcium salt to react with an alkali metal hydroxide,
- in the presence of at least one compound selected from the group consisting of a silicon-based compound, a phosphorus-based compound, an aluminum-based compound, an inorganic acid and an organic acid.

[Claim 4]

The synthetic resin composition of claim 1 or 3,

wherein the synthetic resin is a polyvinyl chloride.  
[Claim 5]

The synthetic resin composition of claim 1 or 3,  
wherein the synthetic resin is a polyvinyl chloride and  
the silicon-based compound is silica.  
[Claim 6]

The synthetic resin composition of claim 1 or 3,  
wherein the calcium hydroxide compound has a chlorine  
element content of not higher than 0.005 wt% and a sodium  
element content of not higher than 20 ppm.  
[Claim 7]

The synthetic resin composition of claim 1 or 3,  
wherein calcium hydroxide compound is used in the form  
of particle  
[Claim 8]

The synthetic resin composition of claim 7,  
wherein the calcium hydroxide particles have an average  
secondary particle diameter, measured by a laser  
diffraction scattering method, of 0.1 to 2.5  $\mu\text{m}$ .  
[Claim 9]

The synthetic resin composition of claim 7,  
wherein the calcium hydroxide particles have a BET  
method specific surface area of 2 to 40  $\text{m}^2/\text{g}$ .  
[Claim 10]

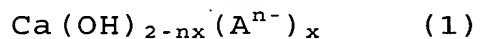
The synthetic resin composition of claim 7,  
wherein the calcium hydroxide particles are  
surface-treated with at least one surface treating  
agent selected from the group consisting of (a) a higher  
fatty acid, (b) an alkali metal salt of a higher fatty  
acid, (c) a sulfuric ester of a higher alcohol, (d) an  
anionic surfactant, (e) a phosphoric ester, (f) a  
silane-, titanate- or aluminum-based coupling agent and  
(g) a fatty acid ester of a polyhydric alcohol.

[Claim 11]

A molded article formed from the synthetic resin composition of claim 1 or 3.

[Claim 12]

A stabilizer for synthetic resins, which comprises a calcium hydroxide compound represented by the following formula (1):



(wherein n represents an integer of 1 to 4, x represents a number of 0.001 to 0.2, and  $\text{A}^{n-}$  represents an anion derived from at least one compound selected from the group consisting of a silicon-based compound, a phosphorus-based compound, an aluminum-based compound, an inorganic acid and an organic acid.)

[Title of Document] Specification

[Title of Invention]

Synthetic resin composition, and its molded article

[Technical Field]

[0001]

The present invention relates to a synthetic resin composition containing a stabilizer that comprises calcium hydroxide formed of a solid solution with a specific additive, and a molded article comprising the above synthetic resin composition. More specifically, it related to a synthetic resin composition containing a determinate ratio of a thermal stabilizer formed of calcium hydroxide that can give an excellent thermal stability to a synthetic resin and further, a smaller degree of initial coloring, and a molded article made from the synthetic resin composition.

[Background Art]

[0002]

Halogen-containing resins are unstable against heat and light and hence, a lead compound, an organotin compound, and a Cd/Ba-, Ba/Zn- or Ca/Zn-based composite organic acid salt have been used as a stabilizer therefor. However, the toxicity of these stabilizers and environmental pollution caused by these stabilizers have started to be acknowledged as problems. Therefore, various stabilizers comprising calcium hydroxide, which is safer and less expensive as a main component, have been developed for halogen-containing resins (refer to Patent Publications 1 and 2).

[Patent Publication 1] JP-A 6-316662

[Patent Publication 2] JP-A 11-193336

[Disclosure of the Invention]

[Problem to be Solved by the Invention]

[0003]

When these calcium hydroxide based stabilizer are added to a synthetic resin, the resulting synthetic resin has poor thermal stability as compared with the above conventional stabilizers. Further, when these calcium hydroxide-based stabilizer are added to a halogen-containing resin, the resulting synthetic resin is very poor in the initial coloring property. Despite these drawbacks, since it has excellent safety and is inexpensive, an improvement of a stabilizer comprising a calcium hydroxide as a main component for a synthetic resin has been desired.

[0004]

Thus, an object of the present invention is to provide a synthetic resin composition that contains an excellent stabilizer and is excellent in long-term thermal stability and in initial coloring property, and a molded article comprising the same.

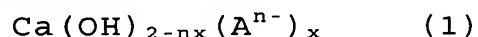
[Means for Solving the Problem]

[0005]

The present inventors have made assiduous studies for modifying calcium hydroxide by use of various substances in order to achieve the above object, and as a result, have found that a synthetic resin composition having an excellent thermal stability and a less initial coloring can be produced when a stabilizer comprising calcium hydroxide formed of solid solution with at least one additive selected from the group consisting of a silicon-based compound, a phosphorus-based compound, an aluminum-based compound, an inorganic acid and an organic acid is added to the synthetic resin.

[0006]

That is, the present invention is a synthetic resin composition comprising (i) 100 parts by weight of a synthetic resin and (ii) 0.1 to 10 parts by weight of a calcium hydroxide compound represented by the following formula (1):



(wherein n represents an integer of 1 to 4, x represents a number of 0.001 to 0.2, and  $\text{A}^{n-}$  represents an anion derived from at least one compound selected from the group consisting of a silicon-based compound, a phosphorus-based compound, an aluminum-based compound, an inorganic acid and an organic acid.)

[0007]

In addition, the present invention is a synthetic resin composition comprising (i) 100 parts by weight of a synthetic resin and (ii) 0.1 to 10 parts by weight of a calcium hydroxide compound obtained by:

(ii-1) causing calcium oxide to undergo a slaking-reaction in water, or

(ii-2) causing a water-soluble calcium salt to react with an alkali metal hydroxide, in the presence of at least one compound selected from the group consisting of a silicon-based compound, a phosphorus-based compound, an aluminum-based compound, an inorganic acid and an organic acid.

[0008]

Further, the present invention includes a molded article comprising the above synthetic resin composition. Still further, the present invention includes a stabilizer for a synthetic resin represented by the formula (1).

[Effect of the Invention]

[0009]



The stabilizer for a synthetic resin used in the present invention exhibits effects by use of calcium hydroxide formed of a solid solution with a silicon-based compound, a phosphorus-based compound, an aluminum-based compound, an inorganic acid or an organic acid, which effects can not be obtained by single use of the respective silicon-based compound, phosphorus-based compound, aluminum-based compound, inorganic acid and organic acid.

[0010]

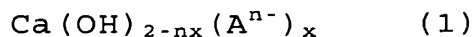
In other word, according to the present invention, there are provided the synthetic resin composition of the present invention and the molded article comprising the same, which have excellent in thermal stability, particularly long-term thermal stability, and improved initial coloring property by adding a stabilizer formed of solid solution with anion derived from at least one compound selected from the group consisting of a silicon-based compound, phosphorus-based compound, aluminum-based compound, inorganic acid and organic acid to a synthetic resin.

[Best Mode for Carrying out the Invention]

[0011]

Hereinafter, the present invention will be further in detail described.

In the present invention, a calcium hydroxide compound represented by the following formula (1)



is used as a stabilizer for synthetic resin.

In the above formula, n represents an integer of 1 to 4, x represents a number of 0.001 to 0.2, and  $\text{A}^{n-}$  represents an anion derived from at least one compound (hereinafter may be referred to as "additive") selected

from the group consisting of a silicon-based compound, a phosphorus-based compound, an aluminum-based compound, an inorganic acid and an organic acid. Therefore,  $n$  is the valence of anion,  $x$  is an anion content, and  $nx$  is their product.

[0012]

Illustrative examples of a monovalent anion represented by  $A^{n-}$  ( $n = 1$ ) include  $\text{SiO}(\text{OH})_3^-$ ,  $\text{Al}(\text{OH})_4^-$ ,  $\text{Cl}^-$ ,  $\text{NO}_3^-$ ,  $\text{H}_2\text{PO}_4^-$  and  $\text{C}_6\text{H}_7\text{O}_7^-$ . Illustrative examples of a divalent anion ( $n = 2$ ) include  $\text{SiO}_2(\text{OH})_2^{2-}$ ,  $\text{Si}_2\text{O}_6(\text{OH})_6^{2-}$ ,  $\text{HPO}_4^{2-}$  and  $\text{C}_6\text{H}_6\text{O}_7^{2-}$ . Illustrative examples of a trivalent anion ( $n = 3$ ) include  $\text{PO}_4^{3-}$  and  $\text{C}_6\text{H}_5\text{O}_7^{3-}$ . Illustrative example of a tetravalent anion ( $n = 4$ ) includes  $\text{Si}_4\text{O}_8(\text{OH})_4^{4-}$ .

[0013]

As  $A^{n-}$ , a plurality of anions of different types may be contained in the compound represented by the formula (1) simultaneously. In this case, a total of products of the valences of the anions and the contents of the anions is represented by  $nx$ .  $x$  is 0.001 to 0.2, preferably 0.005 to 0.15, more preferably 0.01 to 0.1.

[0014]

The above calcium hydroxide compound is a compound formed of a solid solution with at least one compound selected from the group consisting of a silicon-based compound, a phosphorus-based compound, an aluminum-based compound, an inorganic acid and an organic acid.

[0015]

In other word, the calcium hydroxide compound is a calcium hydroxide obtained by  
(i) causing calcium hydroxide to undergo a slaking-reaction in water, or

(ii) causing a water-soluble calcium salt to react with an alkali metal hydroxide, in the presence of at least one compound selected from the group consisting of a silicon-based compound, a phosphorus-based compound, an aluminum-based compound, an inorganic acid and an organic acid.

[0016]

The silicon-based compound is preferably at least one silicon-based compound selected from the group consisting of alkali silicate, a silicate, hydrated silicic acid, silicic acid anhydride and crystalline silicic acid (e.g., quartz). Silica (silicon dioxide) is particularly preferred. The phosphorus-based compound is preferably at least one phosphorus-based compound selected from the group consisting of phosphoric acid, condensed phosphoric acid, polyphosphoric acid and their salts. The aluminum-based compound is preferably at least one aluminum-based compound selected from the group consisting of an aluminum salt, crystalline aluminum hydroxide and amorphous aluminum hydroxide. The inorganic acid is preferably at least one inorganic acid selected from the group consisting of hydrochloric acid, nitric acid and sulfuric acid. The organic acid is preferably at least one organic acid selected from the group consisting of citric acid, tartaric acid, ethylenediamine tetraacetic acid, malic acid, succinic acid, and their salts.

[0017]

The calcium hydroxide is natural lime or synthetic lime. The calcium hydroxide compound has a chlorine element content of not higher than preferably 0.005 wt%, more preferably 0.03 wt% and a sodium element content

of not higher than preferably 20 ppm, more preferably 10 ppm. The sodium element content is measured by an atomic absorption method, and the chlorine element content is measured by an absorptiometric method.

[0018]

(Calcium hydroxide particles)

In the present invention, the calcium hydroxide particles formed of the above calcium hydroxide compound can be used. Although there is no particular restriction on the particle diameter and BET method specific surface area, their contact with the resin becomes decreased as the average secondary particle diameter measured by a laser diffraction scattering method become large and consequently, such problems arise that degrade of thermal stability, decline of mechanical strength, poverty of outer appearance. The calcium hydroxide particle has an average secondary particle diameter measured by a laser diffraction scattering method of preferably 0.1 to 2.5  $\mu\text{m}$ , more preferably 0.5 to 1.5  $\mu\text{m}$ . The calcium hydroxide particle has a specific surface area measured by a BET method of 2 to 40  $\text{m}^2/\text{g}$ , preferably 8 to 30  $\text{m}^2/\text{g}$ . That the particles have not more than 2.5  $\mu\text{m}$  of the average secondary particle diameter means, in other word, that most of the particles are a primary particle, which does not secondarily agglomerate. Further, it has been proved that when the BET method specific surface area of calcium hydroxide is lower than 40  $\text{m}^2/\text{g}$ , there can be obtained synthetic resin composition and molded article having physical properties nearly free from decline caused by thermal degradation.

[0019]

(Production Method)

Firstly, the above calcium hydroxide compound (particle) can be produced by a method described in Japanese Patent Application No. 2002-137581 filed by the present applicant. More specifically, the calcium hydroxide compound can be produced by causing quick lime (calcium oxide) to undergo a slaking-reaction in water containing at least one compound (additive) selected from the group consisting of a silicon-based compound, a phosphorus-based compound, an aluminum-based compound, an inorganic acid and an organic acid. Suitably, quick lime is fed into water, which contains the additive, of 10 to 60°C, preferably 30 to 60°C, to cause it to undergo a slaking reaction under stirring. The reaction temperature is increased by self-generating heat by addition of quick lime and reaches 90°C or higher, for example.

[0020]

Secondly, the calcium hydroxide compound can be produced by allowing an aqueous solution of a water-soluble calcium salt to react with an aqueous solution of an alkali metal hydroxide in the presence of an additive. More specifically, the calcium hydroxide compound can be produced by causing an aqueous solution of a water-soluble calcium salt such as calcium chloride or calcium nitrate to react with an aqueous solution of an alkali metal hydroxide such as sodium hydroxide or potassium hydroxide in the presence of at least one compound selected from the group consisting of a silicon-based compound, a phosphorus-based compound, an aluminum-based compound, an inorganic acid and an organic acid. At this point, it is preferred that the aqueous solution of the alkali metal hydroxide is added in such an amount to be an alkali equivalent

which is equal to or higher than a calcium equivalent (preferably 1.05 to 1.3-fold equivalent). After the reaction, the obtained white precipitate is preferably aged under heating at about 60 to 150°C, preferably about 80 to 120°C, for 0.5 to 4 hours and surface-treated by an anionic surfactant or the like. Then, filtration, washing with water, drying, grinding, classification and the like can be selected as appropriate to produce the calcium hydroxide compound.

[0021]

Thirdly, the calcium hydroxide compound can also be obtained by adding at least one selected from the group consisting of a silicon-based compound, a phosphorus-based compound, an aluminum-based compound, an inorganic acid and an organic acid to a calcium hydroxide particle suspension obtained by putting quick lime to water to cause it to undergo a slaking reaction, and then aging the resulting mixture.

[0022]

The additive is preferably present in an amount of 0.01 to 7 wt%, preferably 0.05 to 7 wt%, more preferably 0.1 to 7 wt%, based on the calcium hydroxide to be produced. When the amount is smaller than 0.01 wt%, the specific surface area of the calcium hydroxide compound to be produced becomes small. Meanwhile, when the amount is larger than 7 wt%, the solid solution limit to calcium hydroxide is exceeded.

[0023]

According to the above-mentioned methods, calcium hydroxide particles having a large BET surface areas can be obtained. It is not revealed, however, what effect of the additive increases the BET surface areas of calcium hydroxide particles. It is assumed that the

increase in the BET surface area occurs because crystal growth is inhibited by the additive which acts as a crystal growth inhibitor.

[0024]

(Aging)

Although calcium hydroxide particles having a large specific surface area can be obtained by the above method, calcium hydroxide particles of higher quality can be obtained by aging the reaction mixture after the reaction. The reaction mixture can be aged at 60 to 170°C, preferably 80 to 120°C, most preferably 90 to 100°C, for 5 minutes to 3 hours, preferably 10 minutes to 2 hours, more preferably 20 minutes to 1 hour.

[0025]

(Grinding)

Further, after completion of the reaction or aging, the obtained calcium hydroxide particles can be ground in a suspension by a grinding means such as a wet ball mill, as required. Thereby, particles having an average secondary particle diameter of smaller than 2  $\mu\text{m}$  can be obtained.

[0026]

(Surface treating agent)

The above calcium hydroxide particles can be surface-treated with a surface treating agent known per se, as desired. The compatibility thereof with a resin or the like can be improved by the surface-treatment. Illustrative examples of the surface treating agent include at least one compound selected from the group consisting of (a) a higher fatty acid, (b) an alkali metal salt of a higher fatty acid, (c) a sulfuric ester of a higher alcohol, (d) an anionic surfactant, (e) a phosphoric ester, (f) a coupling agent (silane-,

titanate- or aluminum-based) and (g) a fatty acid ester of a polyhydric alcohol.

[0027]

Illustrative examples of surface treating agents, which are preferably used, include:

- (a) higher fatty acids having 10 or more carbon atoms such as stearic acid, erucic acid, palmitic acid, lauric acid and behenic acid;
- (b) alkali metal salts of the above higher fatty acids;
- (c) sulfuric esters of higher alcohols such as stearyl alcohol and oleyl alcohol;
- (d) anionic surfactants such as a sulfuric ester of a polyethylene glycol ether, an amide bond sulfuric ester, an ester bond sulfuric ester, an ester bond sulfonate, an amide bond sulfonate, an ether bond sulfonate, an ether bond alkylaryl sulfonate, an ester bond alkylaryl sulfonate and an amide bond alkylaryl sulfonate;
- (e) phosphoric esters such as acid and alkali metal salts and amine salts of a mixture comprising orthophosphoric acid and a monoester and/or diester of oleyl alcohol, stearyl alcohol or the like;
- (f) silane coupling agents such as vinyl ethoxysilane, vinyl-tris(2-methoxy-ethoxy)silane,  $\gamma$ -methacryloxypropyl trimethoxysilane,  $\gamma$ -aminopropyl trimethoxysilane,  $\beta$ -(3,4-epoxycyclohexyl)ethyl trimethoxysilane,  $\gamma$ -glycidoxypropyl trimethoxysilane and  $\gamma$ -mercaptopropyl trimethoxysilane; titanate-based coupling agents such as isopropyl triisostearyl titanate, isopropyl tris(dioctyl pyrophosphate)titanate, isopropyl tris(N-aminoethyl-aminoethyl)titanate and isopropyl tridecyl benzenesulfonyl titanate; aluminum-based coupling agents such as acetalkoxy aluminum



diisopropylate; and

(g) fatty acid esters of polyhydric alcohols such as glycerine monostearate and glycerine monooleate.

The calcium hydroxide particles can be surface-coating-treated by a wet or dry process known per se. For example, in the wet process, a surface treating agent in a liquid or emulsion form is added to slurry of the calcium hydroxide particles and stirred mechanically to a sufficient extent at a temperature up to about 100°C. In the dry method, the calcium hydroxide particles are stirred by a mixer such as a Henschel mixer, a surface treating agent is added in a liquid, emulsion or solid form, and they are fully mixed with or without heating. The amount of the surface treating agent can be selected as appropriate. It is preferably not larger than about 10 wt% based on the weight of the calcium hydroxide particles. The surface-treated calcium hydroxide particles can be formed into a final product form by selecting and performing means such as washing with water, dehydration, granulation, drying, grinding or classification, as required.

[0028]

The calcium hydroxide to be added as a synthetic resin stabilizer is 0.1 to 10 parts by weight, preferably 0.2 to 7 parts by weight, more preferably 0.5 to 5 parts by weight per 100 parts by weight of synthetic resin.

[0029]

(Synthetic Resin)

The synthetic resin is any synthetic resin that is generally used as a molded article. Illustrative examples thereof include thermoplastic resins such as

C<sub>2</sub> to C<sub>8</sub> olefin ( $\alpha$ -olefin) polymers or copolymers, e.g., a polyethylene, polypropylene, ethylene/propylene copolymer, polybutene and poly-4-methylpentene-1, copolymers of these olefins and diene, ethylene-acrylate copolymer, polystyrene, ABS resin, AAS resin, AS resin, MBS resin, ethylene/vinyl chloride copolymer resin, ethylene/vinyl acetate copolymer resin, ethylene/vinyl chloride/vinyl acetate graft polymer resin, vinylidene chloride, polyvinyl chloride, chlorinated polyethylene, chlorinated polypropylene, vinyl chloride/propylene copolymer, vinyl acetate resin, phenoxy resin, polyacetal, polyamide, polyimide, polycarbonate, polysulfone, polyphenylene oxide, polyphenylene sulfide, polyethylene terephthalate, polybutylene terephthalate and methacrylic resin; thermosetting resins such as an epoxy resin, phenol resin, melamine resin, unsaturated polyester resin, alkyd resin and urea resin; and synthetic rubbers such as EPDM, butyl rubber, isoprene rubber, SBR, NBR, chlorosulfonated polyethylene, NIR, urethane rubber, butadiene rubber, acryl rubber, silicone rubber and fluorocarbon rubber. The resin composition of the present invention can be produced by mixing these synthetic resins with the stabilizer for synthetic resin by means of a roll mill or the like.

[0030]

The synthetic resin composition of the present invention may contain other conventional additives in addition to the above components. Illustrative examples of such additives include antioxidants, antistatic agents, pigments, foaming agents, plasticizers, fillers, reinforcers, organic halogen flame-retardants, crosslinking agents, light

stabilizers, ultraviolet absorbers, and lubricants.

[Examples]

[0031]

Hereinafter, the present invention will be described in detail with reference to Examples. In the following Examples, (1) an average secondary particle diameter, (2) a BET specific surface area, (3) an analysis of  $\text{SiO}_2$  and (4) an analysis of  $\text{Al}_2\text{O}_3$  are values obtained by the following measurements.

[0032]

(1) Average Secondary Particle Diameter:

An average secondary particle diameter is measured by a laser diffraction scattering method using MICROTRAC particle size analyzer SPA type [LEEDS & amp; product of NORTHRUP INSTRUMENTS]. More specifically, 700 mg of sample power is added to 70 ml of water and dispersed by ultrasound (product of NISSEI CO., LTD., MODEL US-300, current: 300  $\mu\text{A}$ ) for 3 minutes. Then, 2 to 4 ml of the dispersed solution is sampled and placed in a sample chamber of the above particle size analyzer which contains 250 ml of degassed water. After the analyzer is activated and the suspension is circulated for 8 minutes, particle size distribution is measured. Two measurements are made in total, and the arithmetic average of 50% cumulative secondary particle diameters obtained in the measurements is calculated and taken as the average secondary particle diameter of the sample.

(2) BET Method Specific Surface Area:

Measured in accordance with a liquid nitrogen adsorption method.

(3) Analysis of  $\text{SiO}_2$ :

Analyzed by an absorptiometric method.

(4) Analysis of  $\text{Al}_2\text{O}_3$ :

Measured by a chelating method.

[0033]

(Examples 1-1 to 1-5)

To a 2-m<sup>3</sup> reaction tank, 360 L of 4N NaOH and water glass (398 g/L) in amounts shown in Table 1, and 165 L of 4 mol/L  $\text{CaCl}_2$  were further added, and the mixture was caused to be reacted for 5 to 20 minutes. The obtained reaction products were filtered, dried and ground. The results of chemical analyses and measurements of physical properties are as shown in Table 2.

[0034]

(Examples 1-6 and 1-7)

To a 2-m<sup>3</sup> reaction tank, 360 L of 4N NaOH and sodium aluminate (323 g/L) in amounts shown in Table 1, and 165 L of 4 mol/L  $\text{CaCl}_2$  were further added, and the mixture was caused to be reacted for 5 to 20 minutes. The obtained reaction products were filtered, dried and ground. The results of chemical analyses and measurements of physical properties are as shown in Table 2.

[0035]

(Examples 1-8, 1-9 and 1-10)

To 1 m<sup>3</sup> of  $\text{H}_2\text{O}$ , water glass (398 g/L) was added in amounts shown in Table 1. Then, 27 kg of quick lime was further added, and the mixture was caused to be reacted for 5 to 20 minutes. The obtained reaction products were filtered, dried and ground. The results of chemical analyses and measurements of physical properties are as shown in Table 2.

[0036]

(Comparative Example 1)

In a 2-m<sup>3</sup> reaction tank, 360 L of 4N NaOH and 165 L of CaCl<sub>2</sub> (4 mol/L) were caused to be reacted for 5 to 20 minutes. The obtained reaction product was filtered, dried and ground. The results of chemical analysis and measurements of physical properties of the obtained products are as shown in Table 2.

[0037]

[Table 1]

No.	Additive at the Reaction	Amount of Additive at the Reaction
Example 1-1	Water Glass	0.6 L
Example 1-2	Water Glass	1.2 L
Example 1-3	Water Glass	3.6 L
Example 1-4	Water Glass	6.0 L
Example 1-5	Water Glass	8.4 L
Example 1-6	Sodium Aluminate	4.5 L
Example 1-7	Sodium Aluminate	7.6 L
Example 1-8	Water Glass	0.8 L
Example 1-9	Water Glass	2.4 L
Example 1-10	Water Glass	4.0 L

[0038]

[Table 2]

		C.Ex.1	Ex.1-1	Ex.1-2	Ex.1-3	Ex.1-4	Ex.1-5	Ex.1-6	Ex.1-7
Amount Added to Ca (OH) <sub>2</sub>	SiO <sub>2</sub> : wt% (Measured Value: wt%)	0	0.5 (0.49)	1.0 (1.0)	3.0 (2.8)	5 (4.5)	7 (6.9)	-	-
	Al <sub>2</sub> O <sub>3</sub> : wt% (Measured Value: wt%)	-	-	-	-	-	-	3 (2.9)	5 (4.9)
SiO <sub>2</sub> Solid Solution Ca (OH) <sub>2</sub>	Average Secondary Particle Diameter (μm)	1.2	0.5	0.7	0.9	1.9	2.0	1.6	1.4
	BET (m <sup>2</sup> /g)	9.8	11.0	13.9	21.9	25.7	27.3	10.5	12.1

Ex.: Example, C.Ex.: Comparative Example

[Table 2] (continued)

Ex. Nos.		Ex.1-8	Ex.1-9	Ex.1-10
Amount Added to Ca (OH) <sub>2</sub>	SiO <sub>2</sub> : wt% (Measured Value: wt%)	1.0 (1.0)	3.0 (2.9)	5.0 (4.9)
	Al <sub>2</sub> O <sub>3</sub> : wt% (Measured Value: wt%)	-	-	-
SiO <sub>2</sub> Solid	Average Secondary Particle Diameter (μm)	3.0	1.9	1.6
Solution Ca (OH) <sub>2</sub>	BET (m <sup>2</sup> /g)	33.0	36.0	38.0

Ex.: Example

[0039]

(Examples 2-1 to 2-7)

A 0.7-mm roll sheet was prepared by use of the calcium hydroxide compounds obtained in Examples 1-1 to 1-7 as a stabilizer. More specifically, the calcium hydroxide compounds was added in amount shown in the following compositions and kneaded by means of a roll mill at 180°C for 5 minutes. A test sample having a size of 5 cm x 8 cm was cut out of the sheet, placed in a gear oven heated at 180°C and taken out of the oven every 10 minutes to evaluate its thermal stability. The evaluation was made based on the degree of deterioration of the resin indicated by coloration. The time required to reach a certain degree of blackness was measured, and the color at the first stage of thermal stability measurement was evaluated. The results are shown in Table 3.

[0040]

(Composition)

polyvinyl chloride

(polymerization degree: 700)	100 PHR
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zinc stearate	0.3 PHR
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stearoyl benzoyl methane	0.2 PHR
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stabilizer	1.0 PHR
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dipentaerythritol	0.2 PHR
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[0041]

(Comparative Example 2)

A resin composition was prepared through a treatment similar to that of Examples 2-1 to 2-7 by use of hydrated silicon dioxide (CARPLEX #80, SiO<sub>2</sub> content: 95 wt%) of Shionogi & Co., Ltd. as a thermal stabilizer. The results are shown in Table 3.

[0042]

(Comparative Example 3)



50 kg of slaked lime and 1.5 kg of hydrated silicon dioxide powder (CARPLEX #80, SiO<sub>2</sub> content: 95%) of Shionogi & Co., Ltd. were mixed together by use of a V blender for 2 hours to prepare a test sample. The test sample was subjected to the test similar to that of Examples 2-1 to 2-7. The results are shown in Table 3.

[0043]

[Table 3]

No.	Additive Solid-Solubilized in Calcium Hydroxide	Amount of Additive to Calcium Hydroxide (wt%)	Color at the first stage of Thermal Stability measurement	Time to Blacken
C.Ex.1	-	-	++++	100
Ex.2-1	Silicon Dioxide	0.5	++	114
Ex.2-2	Silicon Dioxide	1.0	+	129
Ex.2-3	Silicon Dioxide	3.0	+	157
Ex.2-4	Silicon Dioxide	5.0	+	143
Ex.2-5	Silicon Dioxide	7.0	++	143
Ex.2-6	Aluminum Oxide	3.0	+	129
Ex.2-7	Aluminum Oxide	5.0	+	129
C.Ex.2	-	-	Black	Unmeasurable
C.Ex.3	Silicon Dioxide	3.0	++++	90

C.Ex.: Comparative Example Ex.: Example

(Note)

Color at the first stage of Thermal Stability measurement:

"colorless and transparent" was rated as "+", "pale yellow and transparent" was rated as "++++", and differences in color therebetween were expressed by the number of "+".

Time to Blacken: Time to blacken in Comparative Example 1 was set at 100, and was measured.

[0044]

(Example 3)

The solid solution calcium hydroxide after the reaction obtained in Example 1-3 was surface-treated by aging it under heating at 60°C for 30 minutes. Thereafter, 5 L of NaOH and 20 L of H<sub>2</sub>O were added to 1 kg of surface treating agents shown in Table 4, and agitated. The resulting mixtures were added to the above reaction product and heated to 60°C, except that in the case of the Example 3-1-3-L2, 1 kg of the surface treating agent was added to the above reaction product.

[0045]

[Table 4]

No.	Name (Abbreviation) of Surface Treating Agent
Ex.3-1-3-A	Stearic Acid (A)
Ex.3-1-3-B	Oleic Acid (B)
Ex.3-1-3-J	Phosphoric Ester (J)
Ex.3-1-3-L2	Vinylsilane (L2)
Ex.3-1-3-L1	Lauric Acid (L1)

[0046]

The above surface-treated solid solution calcium hydroxide were added to the PVC in the same manner as in Example 2, and the thermal stability and initial coloration of the compositions were tested. The results are shown in Table 5. As shown in Table 5, there are no differences in the results caused by use of the different surface treating agents.

[0047]

[Table 5]

No.	Color at the first stage of Thermal Stability	Time to Blacken (minutes)
Ex.3-1-3-A	Colorless and Transparent	55
Ex.3-1-3-B	Colorless and Transparent	55
Ex.3-1-3-J	Colorless and Transparent	55
Ex.3-1-3-L2	Colorless and Transparent	55
Ex.3-1-3-L1	Colorless and Transparent	55

[Industrial Applicability]

[0048]

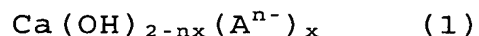
Since the synthetic resin composition of the present invention is superior in thermal stability and initial coloring property, its use in the field of a variety of molded articles is expected.

[Title of Document] Abstract

[Abstract]

[Subject] The object of the present invention is to provide a synthetic resin composition and a molded article formed from it, which are excellent in thermal stability and initial coloring property.

[Means of Solution] The present invention is a synthetic resin composition comprising (i) 100 parts by weight of synthetic resin and (ii) 0.1 to 10 parts by weight of calcium hydroxide compound represented by the following formula (1):



(wherein n represents an integer of 1 to 4, x represents a number of 0.001 to 0.2, and  $\text{A}^{n-}$  represents an anion derived from at least one compound selected from the group consisting of a silicon-based compound, a phosphorus-based compound, an aluminum-based compound, an inorganic acid and an organic acid.)

[Selected Drawing] nil